

Abstract

A pump control system and method employs a variable drive for controlling the speed of an AC electric motor driving a cyclic load. A real-time tuning of the frequency and voltage of the AC input to the motor allows a controlled variation of a cycle speed of the cyclic load. The control system and method adjusts motor speed according to a desired motor speed characteristic for different portions of a complete cycle and over multiple cycles of the cyclic load. The variable drive rectifies a poly-phase AC power input to provide a source of DC power on a DC bus and periodically samples the DC bus current and DC bus voltage across the DC bus to optimize the motor operation. A preselected voltage-frequency profile and a set of motor parameters including a torque set point or a torque range consistent with the desired motor speed characteristic derived from a motor load profile for different portions of a cycle of the cyclic load are provided to the variable drive to substantially minimize regeneration, mechanical loading, energy consumption and maximize production and operational efficiencies. To control the motor speed, synthesized AC motor drive signals are fed to the motor at the appropriate frequency and voltage required to increase or decrease motor speeds consistent with the desired motor speed characteristic during the different portions of the cycle of the cyclic load to significantly reduce energy requirements of the pump control system.